Task Title: Scanning Pulsed Eddy Current for Aviation Applications

Investigation Team: Principal Investigators: J. R. Bowler, M. Johnson, Iowa State University; D. Moore, AANC, D. Wilson, B. Jappe, Boeing-Long Beach; S. LaRiviere, J. Thompson, Boeing - Seattle. Commercial Airlines: Morris Johnson, NWA

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Program initiation date: Program initiated as IA026 September 25, 1998 with scheduled ending date of October 31, 2002.

Objective:

- To transition the pulsed eddy current (PEC) technology from the developer to the user community and to facilitate its rapid introduction and acceptance in commercial aviation.
- To develop and demonstrate new PEC-based detection and characterization methods for small fatigue cracks in multilayered aircraft structures.
- To transition the PEC methodologies for corrosion and crack detection in cooperation with the industrial partners.

Research Activities:

- Provide 1st generation PEC hardware/software for industry evaluation for corrosion and crack detection applications
- Adaptation existing system to commercial scanner
- Initiate crack detection studies to assess sensitivity and optimize probe designs for industry applications
- Develop 2nd generation system with industry feedback
- Demonstrate 2nd generation system on industry defined applications

Anticipated Results:

- Improved pulsed eddy current system for use in aviation applications including familiarization of the technique with the commercial aviation community

Accomplishments:

April, 1998: Initial planning meeting with FAA and representatives from Boeing Seattle and Boeing Long Beach.

June, 1998: Demonstration of the PEC scanner at NWA-Minneapolis.

December, 1998: New generation of the PEC software completed. Two PEC boards have been fabricated. Detailed communication with the OEM partners has determined the integration strategy. System transferred to Boeing-Seattle for field testing.

February, 1999: Visit to Boeing, St. Louis. Information exchange on ISU PEC and Boeing MAUS systems.

June, 1999: Visit to Boeing, Seattle to discuss first generation PEC performance evaluation.

August, 1999: Visit to AANC for field evaluation trials of the first generation PEC system.

November,1999: Visit to Cessna for discussion on arrangements for making measurements on test specimens.

May, 2000: Laboratory prototype of the second generation PEC system completed.

October, 2000: Completed pulsed eddy current simulation software for the analysis of flaw signals.

August, 2001: Participation in the AANC structured corrosion experiment.

August, 2001: Visit to Cessna for an evaluation of the 2nd generation PEC system.

April, 2002: Participated in SAIC round-robin corrosion experiment for the evaluation of different pulsed eddy current technologies.

Publications:

ì Corrosion Evaluation Using a Pulsed Eddy-Current Instrumentî , Review of Progress in Quantitative Nondestructive Evaluation, Ames, Iowa, July 2000.

ì Improved Pulsed Eddy-Current Measurements On Subsurface Defects Using Differential-Reflection And Hall-Device Probesî , Electromagnetic Nondestructive Evaluation, Des Moines, Iowa, August 1999.

ì Improved Pulsed Eddy-Current Measurements On Subsurface Defects Using Differential-Reflection And Hall-Device Probesî , Review of Progress in Quantitative Nondestructive Evaluation, Montreal, July 1999.